

Thermodynamics Summative Questions

1. Calculate the energy transferred when a block of aluminum at 130.0°F is placed in 2.16 liter (2.16kg) of water at 45.0°F if the final temperature becomes 87.0°F . Next, solve for the mass of the Aluminum block.
2. Calculate the energy transfer in a wall section measuring 17' by 9' by 11" thick with a thermal conductivity of 0.08. Opposing sides of the wall section have a temperature of 69°F and 19°F after three hours.
3. Prior to dressing for school, a student watches the morning weather to decide what clothes to wear. The atmosphere is 31°F and the student's skin is 91.4°F . Determine the net energy transfer from the student's body during the 15.0 minutes spent watching the morning weather. **Note:** Skin emissivity is 0.90, and the surface area of the student is 1.32m^2 .
4. A 15.70kg piece of aluminum metal at 290.0°F is placed in 4.00 liters (=4.00 kg) of water at 50.0°F . Determine the final temperature (T_f)
5. A 3/16 in. thick acrylic testing box with dimensions of 12.0 in. x 8.0 in. is covered with an unknown 0.125 in. insulation material. Determine the thermal conductivity for the insulating material if a 25.0W bulb is used to heat the box. The bulb maintains the inside temperature at 23.0°C higher than the outside temperature.

6. You have the job of designing a residential home. The walls of the home must have an R-value greater than 24.4. You choose the following items to construct the wall: 5/8" drywall, 2x6 Stud, fiberglass insulation, 1/2" Particle board, 1 1/2" Polystyrene, and 4" Brick. Is the following set of building materials enough to reach the desired R-value? If not, what needs to change?